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**Sustoil**





SEVENTH FRAMEWORK PROGRAMME




**Delivering Innovative, Commercial & Sustainable Solutions**

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**[www.greenchemistry.net](http://www.greenchemistry.net)**



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## Sustoil: Sustainable Oils

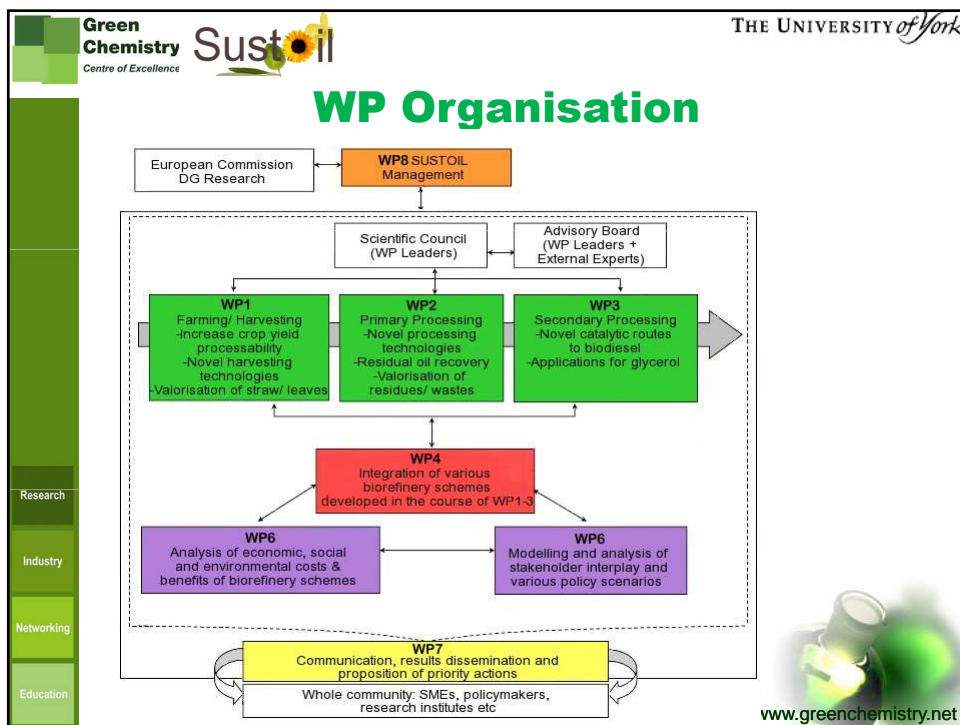
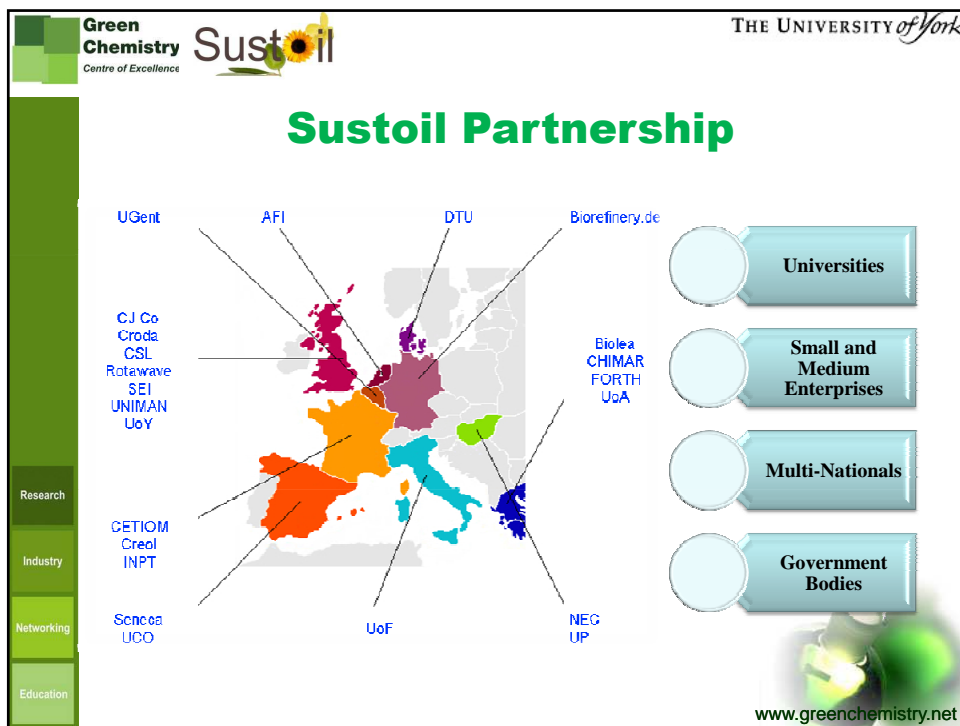
*AIM: To develop advanced biorefinery schemes to convert whole EU oil-rich crops into energy (fuels, power and heat), food and bioproducts (chemicals and/or materials) making optimal uses of the side streams.*

- Funded by the European Union
- Aim to identify main technological challenges & knowledge gaps
- Lead to the development of new cooperative networks



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**Work Package 1 Results: Optimisation of oil crops agronomy and oil yield, and utilisation of by-products.**

- The yield of oilseed rape can be doubled by increasing selective breeding, genetic manipulation and improving crop management practice.
- The sunflower crop yields can be improved by matching the cultivar with the water availability and replacing water-demanding crops with sunflower.
- The by-products of these crops include the straw, stalk and the leaves which can contain numerous valuable chemicals such as hydrocarbons, wax esters, aldehydes, ketones, alcohols and acids.
- Chemicals such as methane and levulinic acid can be obtained from by-products using anaerobic digestion and green chemistry methods.
- Alternatively the by-products can be pelletised and used as a direct fuel for energy production.
- The straws can contain large amounts of pectin and can also be used as a feedstock for producing various types of materials such as biosorbents, paper and particle boards.

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**Work Package 2 Results: Optimisation of oil-rich crop primary processing i.e. the extraction of oil.**

- The removal of residual oil is important utilising clean technologies such as supercritical CO<sub>2</sub> extraction and microwave processing.
- The oil refining process leaves behind free fatty acids (as soap stock), pigments, phosphotides, soaps, metals, phytosterol and tocopherol.
- Valuable extractives from rape meal (from rapeseed oil) have been identified such as bioactive proteins, biocidal, pesticidal and antioxidant compounds.
- After olive oil extraction the pulp can valorised via anaerobic digestion to produce high yields of methane and hydrogen.
- The rapeseed and sunflower cakes are promising raw materials for material production via thermo-mechanical processing.
- Further work is required on removing the high levels of amino acids from sunflower and rapeseed. The cellulose content can be converted into Levulinic acid or ethanol.

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### Work Package 3 Results: Optimisation of secondary processing i.e. biodiesel production

- Glycerol is a by-product of biodiesel production and can cost companies significant amounts to dispose.
- However there are a number of uses of this by-product and when simply purified the clean glycerol can have saleable value.
- Glycerol can also be used as a chemical building block to produce an array of chemicals such as propylene glycol, triacetin and succinic acid
- Glycerol can be used to produce additives for the production of wood panels.
- Interestingly novel routes to biodiesel have been identified which do not produce any glycerol by-product

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### The Next Stage: Work Package 5 and 6

- Full life cycle assessment and computational modelling of the economic, social and environmental costs and benefits of developed biorefinery schemes.
- Policy scenarios will be developed to understand any potential environmental, economic and policy constraints the bioenergy and biorefinery sector could face within a sustainable development framework.

Detailed reports on each of the work packages are available on the Sustoil website ([www.sustoil.org](http://www.sustoil.org)).

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